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ABSTRACT

When total scores on the California Preschool Social Competency Scale (CPSCS) of disadvantaged children attending New York State experimental prekindergarten programs in 1975-76 were replaced by factor scores derived through principal component analysis, exposure time had no significant relationship to three components of the scale: considerateness, task orientation, and response to the unfamiliar. Exposure time did have a curvilinear and generally positive, if subtle, relationship to the extraversion component and to the verbal facility component. Thus, there does appear to be a positive relationship between the time children spent in programs and their rating on the CPSCS at the end of the programs. The relationship is restricted, however, to those parts of the scale which measure extraversion and, to a larger extent, verbal competence. The decomposition of the total CPSCS score into its principal components as criterion variables in regression analysis has isolated the areas of social competency on which prekindergartens have an effect. Moreover, the strength of the effect on verbal social competency has been found to be greater than the previously found effect on overall social competency as measured by the total scale score. (Author/RH)

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EFFECTS OF EXPOSURE TO PREKINDERGARTEN
ON FIVE SOCIAL COMPETENCY FACTORS

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EFFECTS OF EXPOSURE TO PREKINDERGARTEN
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The greater portion of the evaluation effort regarding preschool programs for the disadvantaged has focused on cognitive effects rather than on less easily definable social-emotional effects. There is a body of somewhat limited evidence gathered in a number of studies on the Head Start program which indicates that "Head Start does positively contribute to the development of socially mature behavior" (Mann, Harrell and Hurt, 1977, p. 35). Most of these studies were limited in scope and based on small samples. Moreover, the outcome measures used were usually global scores purporting to measure a vaguely defined construct such as social competency or social maturity. The current study seeks to add to these findings in the context of a large state-coordinated prekindergarten program for disadvantaged children.

Previous work (Hick, Kukuk, Horan, Irvine and Flint, 1978) found that exposure to PreK had a positive effect on the development of social competency in children as measured by the total score on the California Preschool Social Competency Scale. This global measure, however, was found by Flint, Hick, Horan, Irvine and Kukuk (1980) to break down clearly into five dimensions when the item scores were factor analyzed. The present paper will seek to refine the findings of Hick et al. (1978) using the five factors separately as criterion variables instead of one global California score.

Method

Subjects

Subjects were 1402 disadvantaged children who attended the New York State Experimental Prekindergarten Program in 52 school districts throughout the State in 1975-76. The group was about evenly divided between boys and girls. Their average age was 4 years, 3 months at time of entry to PreK. The mean for mother's education was 10.9 years.

Criterion Instrument

The California Preschool Social Competency Scale (referred to hereafter as "the California") was used to measure social competency. As the manual states, the scale "was designed to measure the adequacy of preschool children's interpersonal behavior and the degree to which they assume social responsibility." The items are representative of "the critical behaviors in the preschool child's social functioning." The scale consists of 30 items which "cover a wide range of behaviors. . . . Each item contains four descriptive statements which represent varying degrees of competence relative to the behavior measured by that item." Objectivity in making ratings is encouraged by the design of the items, which are stated in behavioral terms and which "require observations of actual performance rather than inferences about presumed abilities or capacities." The instrument is normed for use with children of 2½ to 5½ years of age. The authors report interrater reliability coefficients of .75 to .86 (Levine, Elzey, and Lewis, 1969).

Validity of the scale was assessed through a three-way analysis of variance using sex, age, and occupational level of parents as the three dimensions of the analysis. A reviewer, reporting on this study, stated that

One could consider the analysis in terms of construct validation, since certain hypothetical expectations about social competency are verified. While all three main effects in the design yielded significant differences at the .01 level, none of the interactions did. Thus, the developmental trends observed are clean from the usual exceptions. First, the older the child is, the more socially competent he becomes. Second, girls are more competent than boys. Third, children whose parents are of high occupational level have greater social competency than do children whose parents are of low occupational level. (Proger, 1974)

Flint, Hick, Horan, Irvine and Kukuk (1978) showed that the California scale breaks down clearly into five dimensions when the item scores are factor analyzed. A principal components analysis with varimax rotations produced five orthogonal factors, which accounted for about 60 percent of the variance in the scale. Examination of the content of the items loading on each factor led to the labelling of these factors as shown in Table 1. The percentage of variance accounted for by each factor is also given in this table.

Table 1
California Factors and Percentage of Variance Accounted For

Factor	Percentage of Variance
1. Considerateness	16.2
2. Task Orientation	14.0
3. Extraversion	11.5
4. Verbal Facility	10.2
5. Response to Unfamiliar	7.9

Procedure

Factor scores were computed based on the rotated factors of the principal components solution described by Flint et al. (1978). Cases with missing data on any item in the California scale were dropped, so that the present study sample of 1,402 is smaller than that of the Hick et al. (1978) study by 123 cases. This 8 percent decrease did not appear to affect the sample characteristics under study, as the means and standard deviations of the predictor variables reported by Hick are almost identical to those shown here in Table 2.

Table 2
Descriptive Statistics for Prekindergarten Children
on Five Factors and Five Predictor Variables
n=1402

Factor/Predictor Variable	Mean	S.D.	Minimum	Maximum
Considerateness	0.0	1.0	-3.8	2.3
Task Orientation	0.0	1.0	-4.0	2.7
Extraversion	0.0	1.0	-3.3	3.4
Verbal Facility	0.0	1.0	-5.4	2.4
Response to Unfamiliar	0.0	1.0	-4.2	3.0
Exposure Time in hours	345	200	10	1386
Scheduled Time in hours	406	216	25	1494
Duration in days	246	19	94	286
Age in days	1560	111	1011	2082
Mother's Education in years	10.9	2.5	0.0	18.0

The strategy adopted for detecting program effects was to determine whether naturally occurring differences in the amount of time children are exposed to the prekindergarten program are accompanied by differences in ratings on the California factors. Other variables which could conceivably explain such a relationship were controlled for, namely: mother's education, child's age, scheduled time and duration in the program. No

control group was available in this study because the California scale was designed to assess children's functioning in a school setting, and the control group used for assessment of cognitive development was not in school.

Table 3 shows the correlations among the five criterion variables and the five predictor variables. There is, of course, no significant correlation among the criterion variables, which are orthogonal factor scores. Among the criteria, the Verbal Facility factor correlates most highly with the exposure time variable. Extraversion and Considerateness have a lower correlation with exposure time; the direction is positive for Extraversion and negative for Considerateness.

Table 3
Intercorrelations of Five Factor Scores and Five Predictor Variables

	2	3	4	5	6	7	8	9	10
1. Considerateness	-.00	-.00	.01	-.01	-.07	-.09	.00	-.01	-.01
2. Task Orientation		-.00	-.01	.01	.02	.01	-.02	.13	.11
3. Extraversion			-.00	-.01	.08	.07	-.02	.04	.05
4. Verbal Facility				-.00	.17	.15	.05	.07	.27
5. Response to Unfamiliar					-.02	-.02	-.02	-.03	.07
6. Exposure Time						.96	.13	.01	.13
7. Scheduled Time							.11	.00	.09
8. Duration								-.08	.05
9. Age									-.00
10. Mother's Education									

The method of analysis followed by Hick et al. (1978) was repeated here. This method entails a multiple linear regression approach to test hypotheses of interest. A full model (FULL) is generated, which includes all of the predictor information; a restricted model (REST) is then generated, which leaves out some of the information in the predictor set.

The difference between the R^2 of these two models is then tested by the F statistic to give an indication of the significance of the information which was left out in the restricted model. If the difference is not significant, the restricted model becomes the full model and is in turn compared with a new restricted model which expresses a new hypothesis of interest. Models are thus successively reduced until a final model is obtained which contains only the essential variables.

The five factor scores were used separately as the criterion variable in five separate analyses. The starting model for each analysis included the following predictor variables:

E = Time in hours the child was exposed to PreK, divided by 100.

S = Time in hours the child was scheduled, divided by 100.

D = Duration in calendar days from entry into the program to the date the child was rated on the California, divided by 100.

A = Age in days at the time of entry into PreK minus 1000, divided by 100.

M = Years of Mother's Education.

Also included were combinations of these variables to provide for the possibility of third degree curvilinearity for exposure time, scheduled time and duration; and interactions among these variables, including two curvilinear interactions. Age and mother's education were included as control variables.

Results

Considerateness

Considerateness was not related to any of the predictor variables. The hypothesis of no effect was accepted ($F = 1.15$, $df = 16/1385$, $P = .305$) and no additional hypotheses were tested. Exposure time was one of the variables involved and, of course, was not significantly related to considerateness.

Task Orientation

Effects on Task Orientation were studied by first establishing mother's educational level and age of the child as control variables; these were present when each of the remaining hypotheses were tested (Table 4). Interactions, curvilinearity, duration, and scheduled time were then successively removed as control variables. The effect of exposure time was then tested. Open to question was whether there was any slope expressing a relationship between exposure time and task orientation at all levels of (with control for) age and mother's educational level. As Table 4 shows, under this condition, the $F (.04)$ for an exposure time effect was not significant.

Table 4
Multiple Regression Results for Determining Effect
of Exposure Time on Task Orientation

Independent Variable(s) (in order of testing for deletion)	% Variance accounted for ^a	F	df	P
Mother's Education	.010	14.7	1/1385	.000
Age	.017	24.5	1/1385	.000
Interaction of E, S, & D	.004	1.06	5/1385	.383
Curvilinearity	.006	1.42	6/1390	.204
Duration (D)	.0002	.32	1/1396	.572
Scheduled Time (S)	.0011	1.65	1/1397	.200
Exposure Time (E)	.0001	.04	1/1398	.850

^a% Variance accounted for is the percent of criterion variance that variable accounts for in the presence of all listed variables after all rejected variables above it in the table have been removed.

Exposure time does not account for any significant amount of variance in the Task Orientation factor not already accounted for by Age and Mother's Education. These two variables are the only predictor variables remaining in the final model. This model covers three percent of the variance in Task Orientation. Of this, Mother's Education accounts for about one percent and Age accounts for about two percent.

Extraversion

Using the Extraversion factor of the California scale as the criterion, it was first established that both mother's education and child's age had no significant contribution to R^2 (Table 5); accordingly, these variables were eliminated from the model. The interaction terms were also found to be non-significant and were eliminated. Second degree curvilinearity was detected but found not to occur in duration or

scheduled time. Therefore exposure time was deduced to have a second degree curvilinear effect. The simple effects of duration and scheduled time were subsequently tested and found to be non-significant.

Table 5
Multiple Regression Results for Determining Effect
of Exposure Time on Extraversion

Independent Variable(s) (in order of testing for deletion)	% Variance accounted for ^a	F	df	P
Age and Mother's Education	.004	2.84	2/1385	.059
Interaction of E, S, & D	.004	1.02	5/1387	.407
Curvilinearity	.009	2.15	6/1392	.046
3rd degree Curvilinearity	.0004	.17	3/1392	.916
Curvilinearity in Duration	.003	3.74	1/1395	.053
Curvilinearity in Scheduled Time	.0001	.19	1/1396	.666
Duration (D)	.001	1.44	1/1397	.230
Scheduled Time (S)	.001	1.77	1/1398	.183

^a% Variance accounted for is the percent of criterion variance that variable accounts for in the presence of all listed variables after all rejected variables above it in the table have been removed.

The final model, therefore, contained only Exposure Time as a predictor variable, with a second degree curvilinear effect on the Extraversion factor. This relationship is plotted in Figure 1. It is positive up to about 700 hours of Exposure Time. Beyond that the relationship is sharply negative. The mean exposure time, however, is 345 hours, with a standard deviation of 200 hours; so that almost all of the observed cases are included in the upward slope of the curve. In general, then, it can be said that children who have more exposure to the PreK program tend to score higher on the Extraversion factor of the California Scale. The relationship is a subtle one, however, since this model accounts for only a little more than one percent of the variance in the Extraversion factor.

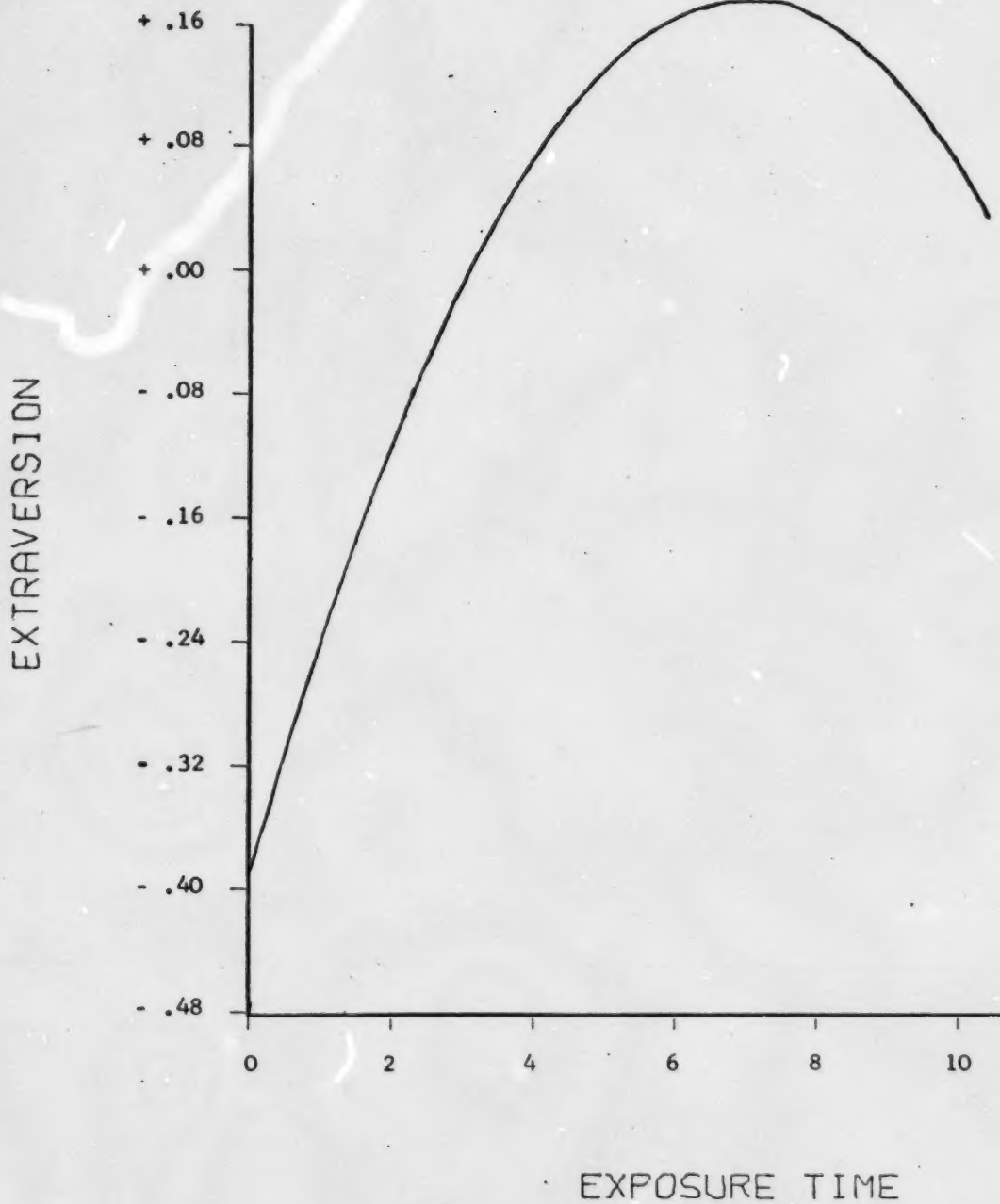


Figure 1. The effect of exposure time on the extraversion factor of the California scale. (Exposure time in hundreds of hours.)

Verbal Facility

In the fourth analysis, scores on the Verbal Facility factor of the California scale were used as the criterion (Table 6). Both Mother's education and Age were found to be significant, Mother's education accounting for about six percent of the variance in the Verbal factor, and Age accounting for about one-half percent. The interaction terms were eliminated from the model, but second degree curvilinearity was found in both Duration and Exposure time. In the presence of these variables, Scheduled time was determined to be non-significant. It was therefore established that Exposure time and Duration have a second degree curvilinear relationship with the Verbal Facility factor regardless of levels of child's age and mother's education.

Table 6
Multiple Regression Results for Determining
Effect of Exposure Time on Verbal Facility

Independent Variable(s) (in order of testing for deletion)	% Variance accounted for ^a	F	df	P
Mother's Education	.059	92.2	1/1385	.000
Age	.005	7.81	1/1385	.005
Interaction of E, S, & D	.005	1.5	5/1385	.187
Curvilinearity	.0142	3.71	6/1390	.001
3rd degree Curvilinearity	.002	1.01	3/1390	.396
Curvilinearity in Duration	.003	3.93	1/1393	.048
Curvilinearity in Scheduled Time	.0003	.51	1/1393	.474
Curvilinearity in Exposure Time	.011	16.7	1/1394	.000
Scheduled Time (S)	.0006	.91	1/1394	.341

^a% Variance accounted for is the percent of criterion variance that variable accounts for in the presence of all listed variables after all rejected variables above it in the table have been removed.

The final model accounts for 11 percent of the variance in this factor. This model is plotted in Figure 2, using fixed levels of Age (4 years, 3 months) and Mother's Education (11 years). This figure covers the major portion of the available data with only 50 cases lying beyond the limits drawn. It is apparent that at any level of duration, children who have been exposed longer to the PreK program tend to score higher on the Verbal Facility factor of the California Social Competency Scale. This effect diminishes beyond 700 hours of exposure time, but there are few cases beyond that point.

Response to the Unfamiliar

The final analysis examined the factor, Response to the Unfamiliar, as the criterion variable. Higher scores on this factor indicate greater adaptability and less insecurity in the face of unfamiliar situations.

Here again, as with the Considerateness factor, there is no significant relationship between the predictor variables and the criterion ($R^2 = .02$, $F = 1.42$, $df = 16/1385$, $P = .12$). Accordingly, the analysis stops here.

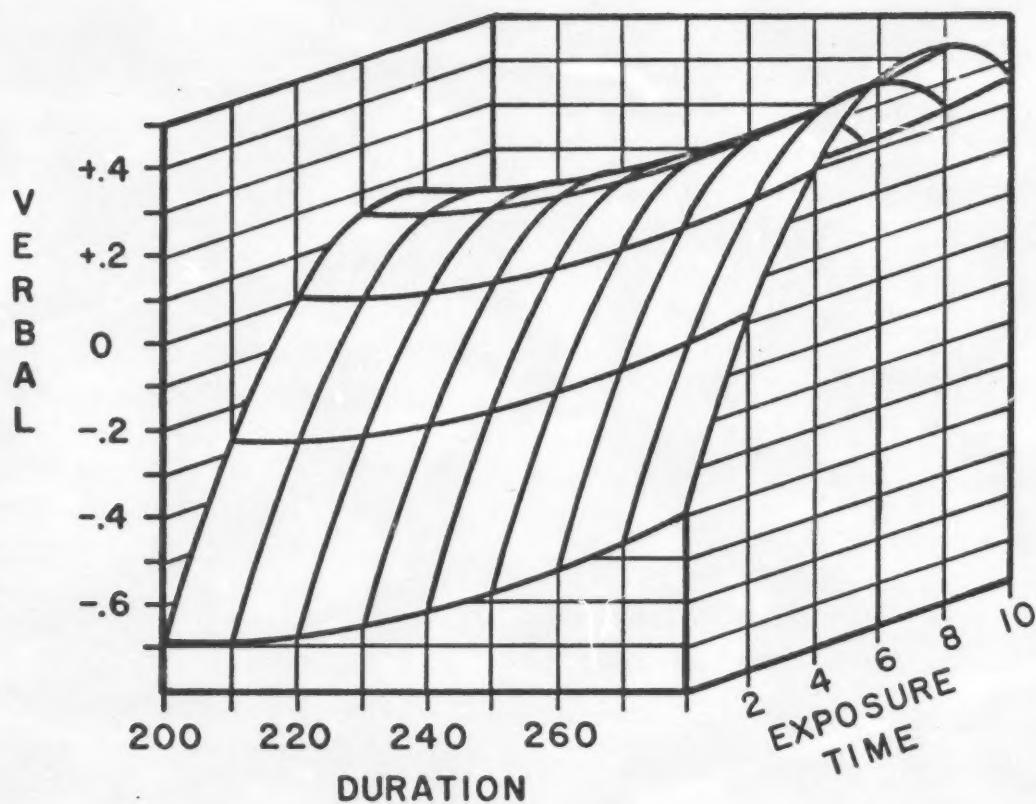


Figure 2. The effect of duration and exposure time on the verbal factor of the California scale. (Duration in calendar days; exposure time in hundreds of hours.)

Summary

When total scores on the California Preschool Social Competency Scale were replaced by factor scores derived through principal components analysis, it was found that Exposure Time has no significant relationship with three of the components of the scale: Considerateness, Task Orientation and Response to the Unfamiliar. Exposure time does have a curvilinear and generally positive relationship with the Extraversion component. This is a subtle relationship with an R^2 of only .012. With the Verbal Facility component, Exposure time has also a curvilinear, and again, generally positive relationship, with an R^2 of .11. This represents an increase of .042 over the R^2 of the final model in the analysis which used the total California score as the criterion, which had an R^2 of only .068.

There does appear then to be a positive relationship between the time children spend in the program and their rating on the California Preschool Social Competency Scale at the end of the program. The relationship is restricted, however, to those parts of the scale that measure extraversion and, to a larger extent, verbal competence. The extraversion depends on rated behaviors such as playing with others, initiating involvement, initiating group activities, giving direction to play, helping others, and responding to unfamiliar adults. Verbal competence is indicated by rated behaviors such as using names of others, identifying self, making explanations to other children, reporting accidents, communicating wants, and following and remembering verbal instructions.

The decomposition of the total California score into its principal components, and the use of these components as criterion variables in regression analysis has isolated the areas of social competency on which PreK has an effect. Moreover, the strength of the effect on verbal social competency has been found to be greater than the previously found effect on overall social competency as measured by the total scale score.

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